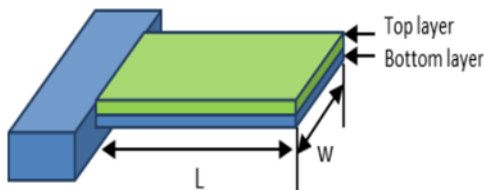


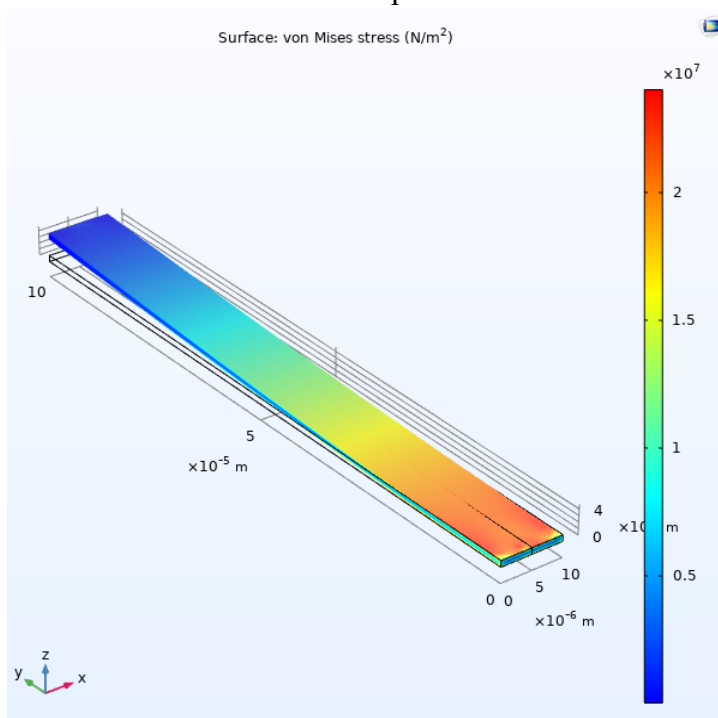
Modelling and analysis of mechanically bending piezoelectric and thermal bimorphs with COMSOL

Final Year project by Ephrun Sardar supervised by Dr Maziar Nehzad

Introduction: Piezoelectric sensors and actuators are being widely used in MEMS. The measurement of their properties has become very important for the tech industry. A bimorph consists of two thin-layers. The difference in strain of two layers of bimorphs causes them to bend or curl which leads to actuation. The bending behaviours of the piezoelectric cantilever beam with and without electrodes are studied. Finite element research techniques are used to provide a better understanding of how a thermal bimorph actuated probe works and to investigate physical phenomena caused by heat transfer. Then the COMSOL simulations will predict the deflection and temperature distribution.



Schematic of thermal bimorph

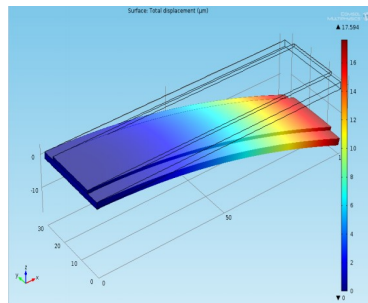


Experimenting with Aluminium and predicting its bending nature

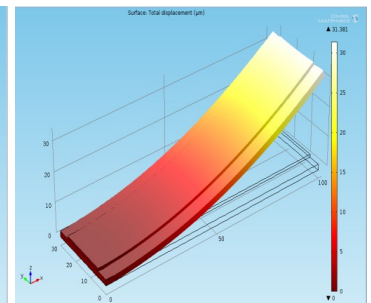
Aims and Objectives:

- Articles studied on how thermal bimorphs works.
- Research about different materials and their thermal characteristics.
- Learn how to operate COMSOL for results simulation.
- Design consideration and choosing right alloys.
- Studying equations to calculate the bending of bimorphs due to temperature factor.
- COMSOL simulations/implementation and results.

Results



Total Displacement



Temperature Distribution

Conclusion: In this project the simulation and study is carried out of thermal behaviour of thermal bimorph using COMSOL. In this we will learn about thermal expansion induced by joule heating of different materials.

References

- Vikram Maharshia, Aditia, b, V Merea, b and Ajay Agarwala, b aCSIR-Central Electronics Engineering Research Institute (CSIR-CEERI), Pilani-333031(Raj) India bAcademy of Scientific and Innovative Research (ACSIR), New Delhi, India
- Rachita Shettar, Dr. B G Sheeparamatti, "Modeling and analysis of thermal Bimorph Using COMSOL".